B.Com(Hons) DEGREE EXAMINATION,APRIL 2019
I Year II Semester
Operations Research

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer **ALL** the questions

1. Define Operations Research.
2. Give an example for an objective function.
3. What is Non-degenerate basic feasible solution?
4. State the basic feasible solution.
5. Explain the meaning of Network Analysis.
6. State the formula for Expected time estimate in PERT.
7. Explain few characteristics of queuing system.
8. State the formulae for E(m) and E(w).
9. What are the criteria for decision making under uncertainity?
10. State the Baye's formula.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

11. Explain the difference between models and modelling. What are the advantages and disadvantages of different models?
12. A company manufactures three types of products which use precious metals platinum and gold. Due to shortage of these metals, the government regulates the amount that may be used per day. The relevant data with respect to supply requirements and profits are summarised in the table below:

Product	Platinum required / unit (gms)	Gold required / unit (gms)	Profit per unit Rs.
P	2	3	500
Q	4	2	600
R	6	4	1200

Daily allotment of platinum and gold is 160 gms and 120 gms respectively. How should the company divide the supply of scarce precious metals? Formulate the mathematical model.

13. Find the optimal solution for the assignment problem with the following matrix

ZONES

		N	E	W	S
SALESMAN	P	11	17	8	16
	Q	9	7	12	6
	R	13	16	15	12
	S	14	10	12	11

14. Solve the following transportation problem for minimum cost.

Destination	Origin				Requirement
	A	B	C	D	15
1	7	4	3	4	25
2	3	2	7	5	20
3	4	4	3	7	40
4	9	7	5	3	100
Availability	12	8	35	25	80

15. The following data are the characteristics of a project

Activity	Immediate Predecessors	Duration(in days)
A	-	2
B	A	3
C	A	4
D	B,C	6
E	-	2
F	E	8

(i.) Draw the network diagram for the above project

(ii.) Find the minimum project completion time and the critical path

16. Customers arrive at a box office window, being manned by a single individual according to a poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer.

17. An industry finds from the past data, that the cost of making an item is Rs.25, the selling price of an item is Rs.30, if it is sold within a week and it could be disposed at Rs.20 per item at the end of the week.

Weekly sales	≤ 3	4	5	6	7	≥ 8
No. of weeks	0	10	20	40	30	0

Find the optimum number of items per week should the industry produce.

18. A distributor of a certain product incurs holding cost of Rs. 100 per unit per week and shortage cost of Rs.300 per unit. The data on the sales of the product are given below:

Weekly sales(units)	0	1	2	3	4	5	6	7	8
No.of weeks frequency	0	0	5	10	15	15	5	0	0

How many units should the distributor buy every week? Also find E.V.P.I.

Section C $(2 \times 15 = 30)$ Marks

PART - A - Case Study - Compulsory Question

19. The following table lists the activities of a maintenance project.

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-7	5-8	6-8	7-9	8-9
Duration(months)	2	2	1	4	5	8	3	1	4	5	3

(i.) Draw the project network

(ii.) Find the critical path and duration of the project

(iii.) Suppose we are required to employ a special piece of equipment on activities 1-3, 3-6, 2-5, 5-8 and 8-9 one at a time, will it affect the duration of the project? Explain.

PART - B

Answer any **ONE** question

20. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs.5760 to invest and has space almost for 20 items. A fan costs him Rs.360 and a sewing machine Rs.240. His expectation is that he can sell a fan at a profit of Rs.22 and a sewing machine at a profit of Rs.18. Assuming that he can sell all the items that he can buy , how should he invest this money in order to maximise his profit? Formulate this problem as a linear programming problem and then use graphical method to solve it.

21. Solve the following transportation problem using VAM in order to minimise the total transportation cost.

	Destinations						
Origin	D1	D2	D3	D4	D5	Availability	Total
OR1	3	5	8	9	11	20	
OR2	5	4	10	7	10	40	
OR3	2	5	8	7	5	30	
Requirements	10	15	25	30	40		120
Total						90	